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IS 8639 (1977): Code for evaluation of the effect of packaging and storage on the sensory qualities of foods and beverages [FAD 14: Drinks and Carbonated Beverages]



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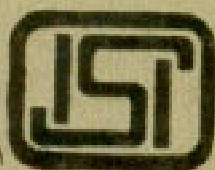
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Indian Standard

CODE FOR EVALUATION OF THE EFFECT OF PACKAGING AND STORAGE ON THE SENSORY QUALITIES OF FOODS AND BEVERAGES

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CODE FOR EVALUATION OF THE EFFECT OF PACKAGING AND STORAGE ON THE SENSORY QUALITIES OF FOODS AND BEVERAGES

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CODE FOR EVALUATION OF THE EFFECT OF PACKAGING AND STORAGE ON THE SENSORY QUALITIES OF FOODS AND BEVERAGES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 November 1977, after the draft finalized by the Sensory Evaluation Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Foods and beverages are packed and stored for maintaining the products nutritional, hygienic and sensory qualities. Objective procedures have been described in other Indian Standards to evaluate specific nutritional and hygienic qualities. The sensory qualities, particularly flavour — the aroma and taste, which are important to the consumer for making judgements on acceptance or rejection of a stored food, have to be evaluated through subjective panel techniques.

0.3 There are many ways in which the flavour of a food may be affected by the packaging material and the conditions of storage. The flavour of the food may show change quantitatively by loss of its total aroma intensity through, for example, the permeability of the packaging films or qualitatively by loss of some of its aroma constituents. It may also acquire foreign aroma from direct contact with the packaging material or from the ingress of environmental odour of the storage container or room. When there is quantitative loss, the product tends to become flat; when there is foreign aroma acquired by the food, it is termed 'tainting' of the food, particularly when the acquired aroma is offensive or unacceptable.

0.4 Potential taint sources of packaged foods are low molecular weight polymers including monomers, thermal degradation products of polymers due to poor processing control or use of partially or fully reprocessed material; additives added in processing plastic materials; solvents from laminates, lacquers, pigments and printing inks, mould and insect inhibitor chemical in papers, cartons and wooden boxes, and cross tainting of food odours when the storage space is used for many different foods.

0.5 A single test is generally insufficient to evaluate the change in flavour, the source and the intensity of the taint. The recommended practice constitutes panel methods which have been found useful for evaluating flavour changes in the packaged food and the packaging material.

0.6 The risk of flavour change, particularly tainting of foods depends on a number of factors, such as type of foods and their susceptibility, the shelf life and conditions of storage, the storage conditions during marketing, and retailing and household storage. Other considerations, allowed are fixing levels of flavour change acceptable to the consumer in consideration, such as convenience to choose between available packaging materials.

0.7 The recommended tests cover the direct examination of odour of packaging materials, the use of model substances in proximity or in contact with packaging materials and packaging and storage of specimen material intended in commercial practice for tainting and flavour changes. Accepted practices of preparing and presenting samples, assembling and interpreting data and norms for accepting or rejecting packaging material are also given.

0.8 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This code covers method for evaluation of the effect of packaging and storage on the sensory qualities of food and beverages.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 5126 (Part I)-1969† and IS : 5126 (Part II)-1969‡ and given in 2.2 shall apply.

2.2 Off-Flavour — The perceivable change in aroma or taste which makes the product flavour typical and often unacceptable.

3. GENERAL TESTING CONDITIONS

3.1 The test shall be carried out under the conditions given in IS : 6273 (Part I)-1971§. However, following additional facilities shall be provided.

*Rules for rounding off numerical values (revised).

†Glossary of general terms for sensory evaluation of foods: Part I Methodology.

‡Glossary of general terms for sensory evaluation of foods: Part II Quality characteristics.

§Guide for sensory evaluation of foods: Part I Optimum requirements.

3.1.1 Clean, dry, odour free laboratory glass bottles with ground surface lids; 1 000-ml capacity petri dishes and disposable plastic spoons having no flavour should be used in direct odour testing of packaging material and taint transfer tests.

3.2 Model food materials used for odour transfer shall be the following:

- a) *Odourless and Tasteless Water* — prepared by treating with activated carbon.
- b) *Icing Sugar*
- c) *Fresh Unsalted Sweet Cream Butter*
- d) *Fresh KHOA*
- e) *Sodium chloride* — pure.

3.3 For tests designed to simulate commercial practice, the product of interest or an odour-sensitive commercial product should be test packed in packaging materials chosen from knowledge of its physical, chemical, microbiological and economic characteristics.

3.4 Storage conditions should be so chosen that no extraneous contaminations affect the packaging system. Suitable time-temperatures ranges and test intervals should be defined. Accelerated conditions for quick evaluation should be used.

3.5 Proper sampling of packaging materials, homogeneous lot of products, uniform packaging and storage operations should be controlled to ensure that no variation occurs except that of the packaging materials or storage systems.

3.6 It should be helpful to include a commercial grade material to represent either satisfactory or maximum permissible levels of odour, when chosen in relation to the food products under study as reference materials.

3.7 Normally up to five samples shall be evaluated at one sitting. The exact number would however depend on the intensity of aroma and off-flavour causing panel fatigue.

4. PANEL

4.1 The recommended tests require a panel selected and trained for ability to discriminate off-flavours of the type expected and when necessary to consistently rate the levels of odour or taint and flavour taste.

4.2 The members of the panel should be briefed on the type of tests and the evaluation card(s) to be used.

4.3 A minimum of five trained panelists (making a minimum of ten judgements where paired tests are done) per sample shall be required. A larger pool of qualified judges should be recommended for accommodating unaccountable individual variations and absenteeism. Panel members should be requalified periodically.

5. TEST METHODS

5.1 Direct Examination of Packaging Materials — There shall be two categories of direct testing: a) immediate examination of random samples from a lot, and b) examination of samples after confining in a closed container to enhance the odour intensity.

5.1.1 Direct immediate examination of samples should be used for preliminary evaluation and may be done as a sniffing test.

5.1.1.1 The film, paper, foil laminates shall be sampled from an approximate inner position of the stack or roll. Crumple one or more individual sheets of approximately 1 000 cm² into a ball and open near the face and sniff.

5.1.1.2 In case of printed materials, choose the sample in such a way that the proportion of printed to unprinted surface shall be representative of the whole material, as would be in a packaging situation.

5.1.1.3 In case of thicker material, such as paper board, sample as above, cut or tear into pieces of 5 cm² and then smell.

5.1.2 Direct Examination after Confining the Samples — Crumple 1 000 cm² of the sample in the case of films and thin materials and cut or torn into pieces of about 5 cm²; in the case of coated film, laminates or boards and placed into a jar with grounded glass closures with minimum exposure to the atmosphere. The material should leave at least 25 percent head space in the jar and kept confined for 24 hours at room temperature. If the use situation requires higher temperatures, elevated temperatures of 37° to 40°C should also be used. Normally prepare one jar for each panelist (in case samples are limited, the same jar may be used for two persons provided more than one hour is allowed for the odour to fill the head space after it is opened for sniffing by one panelist).

5.1.2.1 Prepare another set of sample as in 5.1.2, but with a petri dish containing about 5 ml of water at the bottom. The samples shall be confined for a period of 24 hours at room temperature or at 37° to 40°C before examining.

NOTE — The presence of humidity brings out some types of odours and this test should be particularly appropriate for products normally subjected to moisture.

5.1.3 Give each panelist a pair of jars per sample, one from dry state confinement and one from the wet state confinement.

5.1.3.1 Open the each jar and sniff and categorize the odour as odourless, slight odour and strong odour.

5.1.3.2 Reject the samples falling in the last category as unacceptable and subject those assigned to the first two categories to further tests to evaluate the intensity of off-odour or tainting.

5.1.3.3 When a reference packaging material is available, samples of similar materials should be evaluated by the panel ranking the samples including the reference sample in order of increasing odour intensity. The significance of difference of the experimental samples to that of the reference sample shall be established through the order of their rank sums [see **4.1.4** of IS : 6273 (Part II)-1971* and IS : 6273 (Part III)-1975†].

5.1.3.4 When a reference sample is not available, the significance of odour levels between the experimental samples shall be obtained through their rank sums.

5.2 Changes or Transfer of Odour from Packaging Materials to Model Food Substances

5.2.1 Prepare a set of jars with each packaging materials confined under dry and humid conditions as in **5.1.2** and **5.1.2.1**. In individual jars, place a wide dish containing 30 ml of water or 30 g icing sugar or 30 g sweet cream butter or 30 g *KHOA* or 30 g sodium chloride, on top of the crumpled film but without these food substances contacting the films. Keep confined for 24 hours at room temperature or 37° to 40°C.

5.2.1.1 Prepare similar jars with the three model substances confined but without the packaging material as controls and store for 24 hours at room temperature or 37° to 40°C.

5.2.2 Treat the dry jar series and humid jar series of each model substance separately for evaluation by the panel.

5.2.2.1 Take out each of the food product series and divide just before the panel session into equal portions and distributed by the panel leader into coded glass or porcelain dishes, for example portions of water exposed to the different samples of packaging materials (including the reference packaging sample where available) and the corresponding unexposed control should made into a series for each of the panelist.

*Guide for sensory evaluation of foods: Part II Methods and evaluation cards.

†Guide for sensory evaluation of foods: Part III Statistical analysis of data.

5.2.3 First test a sample of the control model food product as known reference to anchor the flavour. Then test the food products in the series one and rank in order of increasing flavour intensity other than natural to the control.

5.2.3.1 The panelist should be asked to choose words from the descriptive word list given in Appendix A, of possible modification of original odour or off-odours provided, to explain the order of ranking given to the samples.

5.2.3.2 Find out the significance of the difference between the experimental samples from the rank sums [see IS:6273 (Part III)-1975*] and in relation to the reference sample and the unexposed control.

5.2.3.3 Evaluate similarly after a convenient intervals, the next series with the four other model foods for example icing sugar, butter, *KHOA*, sodium chloride by the ranking procedure.

5.2.3.4 The samples under test showing no significant difference from the unexposed control shall be clearly acceptable and those shown to be significantly inferior (high ranking) shall be discarded.

5.2.3.5 Decisions on samples having intermediate rank sums should be made by reranking these samples including any reference samples used and with respect to descriptions of the modified odour of the food or off-odour which the panel gives to explain their order of ranking. The ranks obtained by a sample in the five model foods taken together would also help in taking decision or continuing evaluation or rejecting of samples. Further selections among samples should be made after an estimation of the intensity of the off-flavour as described in 5.3.

5.3 Evaluating Changes in Odour of Commercial Product as Affected by Packaging Conditions

5.3.1 Principle — The recommended method is designed to determine the effects of different packaging materials and storage systems. The experimental materials and/or systems are evaluated against known controls, such as fresh materials when available or consumer acceptance from market products. These methods may also be used when control is not available for relative information on experimental packaging materials and storage systems.

5.3.2 A homogeneous lot of the intended product should be packaged under same conditions and stored, the only variable being packaging material or storage conditions.

NOTE — A suitable accelerated storage test based on nature of the product, in addition to the test specified may be carried out, if necessary.

*Guide for sensory evaluation of foods: Part III Statistical analysis of data.

5.3.2.1 Based on expected total storage period and number of withdrawals of samples for evaluation based on anticipated rate of quality, deterioration, sufficient number of units of each packaging or storage treatment should be stored to provide material for panel testing.

5.3.2.2 It may be advisable to replicate the test on packaging materials under different storage conditions, such as high and low temperatures and high and low humidity to cover anticipated variation in storage system.

5.3.2.3 Accelerated storage conditions, usually higher temperature and humidity (also light intensity, ratio of packaging surface to product and temperature cycle) should be used for providing rapid information. The results, however, should be validated by using normal storage conditions.

5.3.3 Since a comparison of the quality of the product at different storage periods may be required for taking decisions, a rating method should be used. This requires a higher level of training with samples varying in intensity of modified or off-flavour and a fairly homogeneous panel who understand the intensity levels uniformly related to the attribute scale used.

5.3.3.1 Appropriate attribute of quality for testing should be chosen with prior knowledge of product, packaging material and storage conditions. This may be estimates of one or more of the attributes, overall quality, intensity of characteristic flavour of the product, intensity of modified or off-flavour, rancidity, bitterness, etc. Multiple attributes may also be evaluated in a session but the number of samples tested should then have to be reduced to avoid fatigue.

5.3.3.2 A minimum of 5 trained panel members and 10 to 15 judgements should be recommended for each sample or storage system.

5.3.3.3 The evaluation card should include instructions and appropriate rating category scales for one or more attributes, such as overall quality, off-flavour. Examples of category scales are given below:

<i>Overall Quality</i>	<i>Off-Flavour</i>
Excellent	None
Good (slightly less typical and full)	Threshold (just noticeable) hardly affecting product
Average (lacking in flavour texture) but product acceptable	Low (borderline acceptance of product)
Fair (lacks flavour or texture and/or slight off-flavour)	Strong
Poor (strong off-flavour)	Offensive (extreme)

5.3.3.4 The sample should be opened just before the session and divided equally among the panelists by the leader. The samples should be served one by one under conditions for individual judgement and according to a balanced design.

5.3.4 The data for each attribute or storage period should be converted to a numerical 5 point scale subject to variance analysis to establish overall significance for difference among treatments [*see* IS : 6273 (Part III)-1975*].

5.3.4.1 If significant at least at 5 percent level, determine the significance among treatments by the Dunnet Test when a reference sample is used and by Duncans Test where no sample is pre-selected as control.

5.3.4.2 It may be informative to run a combined analysis of variance over data covering all storage periods or treatments.

5.3.5 Accepting or rejecting a packaging material shall be based on average intensity ratings of, off-flavour for different attributes and overall quality of acceptable packaging material established for real-life or end use situations.

For Example:

With the scale, 1 = none to 5 = offensive for off-flavour, all samples with intensity rating equal to or below that of the agreed reference should be acceptable and those above should be rejected. For borderline cases where the average intensity ratings are just above the acceptance value more data should be collected for decision.

5.4 Reporting

5.4.1 The preamble of the report should contain details of samples; identity of reference sample, if any used; storage conditions; period of storage; number of panelists and specific training given.

5.4.2 The data should give details of test method used, such as direct odour sniffing, moist container, specified model food transfer test, ratings of specific food packaged and stored, significance of difference between samples or treatments.

5.4.3 The panel leader's recommended decision on acceptance or rejection of the samples or treatments should be given along with consensus of the sensory quality descriptions given by the panelists.

*Guide for sensory evaluation of foods: Part III Statistical analysis of data.

APPENDIX A

(Clause 5.2.3.1)

LIST OF DESCRIPTIVE WORDS FOR EVALUATION

SL No.	PACKAGING MATERIAL	TYPE OF OFF-FLAVOUR
i)	Paper	Typical of kraft or cardboard Musty or mouldy (ground wood, waste paper)
ii)	Board	Chlorinated phenol (slime control additive) Sour (decomposed starch)
iii)	Regenerated celluloses	Chlorine Sulphury Celluloid or camphory
iv)	Paper coated laminates	Gluey, fermenting Decomposed or heated protein (Casein) Waxy Burnt, oily Oxidized Polyethylene Metallic
v)	Ink and varnish	Solvents — ethanol, 2-ethoxy ethanol <i>n</i> -butanol, toluene, acetone keroseny Painty Inky Pigment discolouration
vi)	Plastics	Lubricants Styrene and vinyl chloride monomers Polyethylene heated (in heat sealing low molecular mass aldehyde, ketone, unpleasant fatty odours)
vii)	Cans (plain and lacquered)	Metallic Sulphury or Sulphidy Solvent (lacquer) Rubbery (closing compound)

INDIAN STANDARDS

ON

SENSORY EVALUATION

IS:

5126 Glossary of general terms for sensory evaluation of foods:

5126 (Part I)-1969 Methodology

5126 (Part II)-1969 Quality characteristics

6273 Guide for sensory evaluation of foods:

6273 (Part I)-1971 Optimum requirements

6273 (Part II)-1971 Methods and evaluation cards

6273 (Part III)-1975 Statistical analysis of data

7675-1975 Method for sensory evaluation of beer

7768-1975 Method for sensory evaluation of milk

7769-1975 Method for sensory evaluation of table butter

7770-1975 Method for sensory evaluation of *ghee* (clarified butterfat)

7997-1976 Method for testing of products of intense flavour

7999-1976 Tasting glass for liquid samples

8104-1976 Method of test for pungency of chillies by scoville heat units

8105-1976 Method for sensory evaluation of pungency of black pepper by scoville heat units

8153-1976 Method for sensory evaluation of fresh fruits

8140-1976 Guide for selection of panel for sensory evaluation of foods and beverages